



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/626,998	07/24/2003	Yi-Li Hsiao	67,200-930	3724

7590 12/20/2005
TUNG & ASSOCIATES
Suite 120
838 W. Long Lake Road
Bloomfield Hills, MI 48302

EXAMINER

MACARTHUR, SYLVIA

ART UNIT	PAPER NUMBER
----------	--------------

1763

DATE MAILED: 12/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/626,998

Applicant(s)

HSIAO ET AL.

Examiner

Sylvia-R. MacArthur

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 July 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okudaira et al ((US 5,705,029) in view of Koshimizu et al (US 2005/0172904).

Regarding claim 1: Okudaira et al teaches a dry etching method. The method maintains a substrate support at a set point temperature in a reaction chamber (vessel 1) upon a rise in temperature of the chamber, comprising the steps of:

Flowing a main coolant fluid (cooling gas) having the set point temperature through the substrate support 5; and circulating a compensation coolant fluid (cooling medium) having a cooling temperature lower than said set point temperature through the substrate support upon the rise in temperature of the chamber.

Okudaira fails to teach circulating the cooling fluid through the support.

Koshimizu et al teaches a plasma processing apparatus with circulating two fluids through a substrate support. He (heat transfer gas, see elements 116,114) and a second gas supply 120 are circulated through the substrate support (electrostatic chuck 108). The motivation to modify the apparatus of Okudaira et al to circulate the fluids is that it provides for an enhanced means of temperature control of the substrate support. The structure of circulating independent fluids through the support provides for separate types

and pressure f heat transfer fluids thus providing a more reliable temperature control mechanism according to [0012] of Koshimizu et al. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to combine the teachings of Okudaira et al and Koshimizu et al to provide a substrate support with heat transfer fluid circulated therethrough.

Regarding claim 3: According to col. 6 line 33, Okudaira et al teaches the cooling temperature is in the range of 50 to 130 degrees C.

Regarding claim 5: Water is used to maintain the temperature of the specimen stage see col. 6 lines 31-39.

Regarding claim 9: Compensation coolant chamber 3 contains a compensation coolant (cooling medium) in fluid communication with the substrate support 5.

Regarding claims 2,4, 6,8, 10, and 12 :

Okudaira et al and Koshimizu et al fail to teach that the set point temperature is about 60 degrees C. However, the set point temperature of the chuck is an optimizable parameter based on such factors as type of coolant used and desired final temperature of substrate.

These processing parameter are well within the ordinary skill of one in the art to determine in order to provide the optimal heat transfer between the coolant and the substrate.

Thus, it would have been obvious for one of ordinary skill in the art to choose a coolant with a set point temperature of about 60 degrees C.

Art Unit: 1763

3. Claims 1, 9-12 and 15 are rejected under are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagaiwa et al (US 6,723,202) of Koshimizu et al (US 2005/0172904).

Regarding claim 1: Nagaiwa et al teaches a dry etching method. The method maintains a substrate support at a set point temperature in a reaction chamber 2 upon a rise in temperature of the chamber, comprising the steps of:

Flowing a main coolant fluid (ethylene glycol) having the set point temperature through the substrate support 6; and circulating a compensation coolant fluid (gas passage 9) having a cooling temperature lower than said set point temperature through the substrate support upon the rise in temperature of the chamber. fails to teach circulating the cooling fluid through the support.

Koshimizu et al teaches a plasma processing apparatus with circulating two fluids through a substrate support. He (heat transfer gas, see elements 116,114) and a second gas supply 120 are circulated through the substrate support (electrostatic chuck 108). The motivation to modify the apparatus of Nagaiwa et al to circulate the fluids is that it provides for an enhanced means of temperature control of the substrate support. The structure of circulating independent fluids through the support provides for separate types and pressure f heat transfer fluids thus providing a more reliable temperature control mechanism according to [0012] of Koshimizu et al. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to combine the teachings of Nagaiwa et al and Koshimizu et al to provide a substrate support with heat transfer fluid circulated therethrough.

Art Unit: 1763

Regarding claim 9: Compensation coolant chamber contains a compensation coolant (gas passage 9) in fluid communication with the substrate support 6. See Fig. 1.

Regarding claim 15: The method of Nagaiwa et al provides a compensation circulation loop 11c see col. 6 lines 24-34.

Regarding claims 10 and 12:

Both Nagaiwa et al and Koshimizu et al fail to teach that the set point temperature is about 60 degrees C. However, the set point temperature of the chuck is an optimizable parameter based on such factors as type of coolants used and desired final temperature of substrate. This processing parameter is well within the ordinary skill of one in the art to determine in order to provide the optimal heat transfer between the coolant and the substrate.

Thus, it would have been obvious for one of ordinary skill in the art to choose a coolant with a set point temperature of about 60 degrees C.

4. Claims 7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okudaira et al or Nagaiwa et al in view of Koshimizu as applied above, in further view of Hideo et al (JP 2003-248322).

The teachings of Okudaira et al or Nagaiwa et al in view of Koshimizu et al were discussed above.

Both modifications fail to teach the coolant temperature is about 50 degrees C.

Hideo et al teaches a method for producing an original printing plate (a semiconductor manufacturing process). A coolant is used to maintain the temperature of the substrate according to Section [0084]. The coolant temperature is 50 degrees C or less.

The motivation to provide the coolant at that temperature is that it is suggested by Hideo et al that 50 degrees C or less provides the optimal heat transfer for optimal temperature control of the wafer.

Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the method of Okudaira et al or Nagaiwa as modified by Koshimizu et al with the teachings of Hideo to provide the coolant at 50 degrees C as it provides optimal heat transfer.

5. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagaiwa et al in view of Koshimizu et al, as applied above, in further view of Okudaira et al.

The teachings of Nagaiwa et al as modified by Koshimizu et al were discussed above.

The modification fails to teach that the coolant temperature is about 50 degrees C and that the set point temperature is 60 degrees C

Okudaira et al teaches that the coolant temperature is in the range of 50 to 130 degrees C.

The motivation to provide the coolant temperature at the above range is an optimizable parameter. Likewise the set point of the chuck is an optimizable processing parameter. These processing parameters are well within the ordinary skill of one in the art to determine in order to provide the optimal heat transfer between the coolant and the substrate.

Thus, it would have been obvious for one of ordinary skill in the art to choose a coolant temperature of about 50 degrees C and a set point temperature of about 60 degrees C.

6. Claims 13,14, and 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagaiwa et al or Okudaira et al in view of Koshimizu et al, as applied above, in further view of Long et al (US 6,608,352).

The teachings of Nagaiwa et al or Okudaira et al modified by Koshimizu et al were discussed above.

Both modifications fail to teach a p-n junction module.

Long et al teaches a chuck 208 coupled to a temperature controller 210 a p-n junction current meter 214 is coupled between the p-n junction formed by the first doped region 204 and the drain region 156, see col. 6 lines 9-48.

The motivation to provide a p-n junction module is that it provides a mechanism for determining the thermal resistance of a substrate in an easy yet accurate manner.

Regarding claim 17: A main temperature characteristic curve is seen in Fig. 5.

Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the method of Nagaiwa et al or Okudaira et al as modified by Koshimizu et al to provide a pn junction module to determine the thermal resistance of the substrate and thus enhance process control.

Conclusion

Response to Arguments

7. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection. Koshimizu et al was introduced as a secondary reference


Art Unit: 1763

to teach circulating a fluid through the substrate support. Note the term circulating is denoted in various ways one of which is moving or (in this case flowing) from place to place. It also could refer to beginning and ending at the same starting point as in recycle. Perhaps the term circulating should be replaced by recycle or recirculating to prohibit such confusion in terminology.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438. The examiner can normally be reached on M-F during the core hours of 9 a.m. and 3 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Sylvia R. MacArthur
Patent Examiner
Art Unit 1763

December 12, 2005